In this experiment you will wire a circuit containing a known voltage and current and you will calculate the unknown resistance. You will then measure the actual resistance and compare it to the calculated value.

PROCEDURE

1. Connect the voltmeter to the +V3 supply as shown in Figure 5, measure the voltage and record the value.

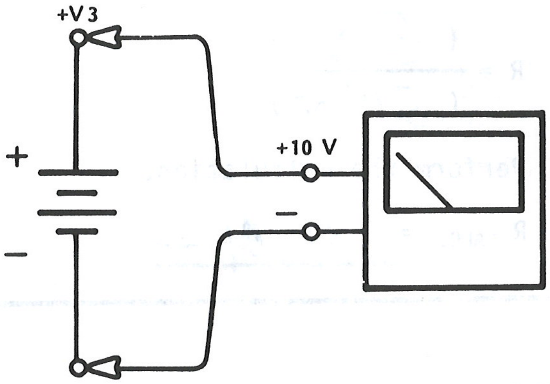


Figure 5 - Measuring the voltage at +V3; EXPERIMENT.

V_3 = 9.5 00 V

14.1 RESISTANCE CALCULATION

2. Turn Off the power and wire the circuit in Figure 6.

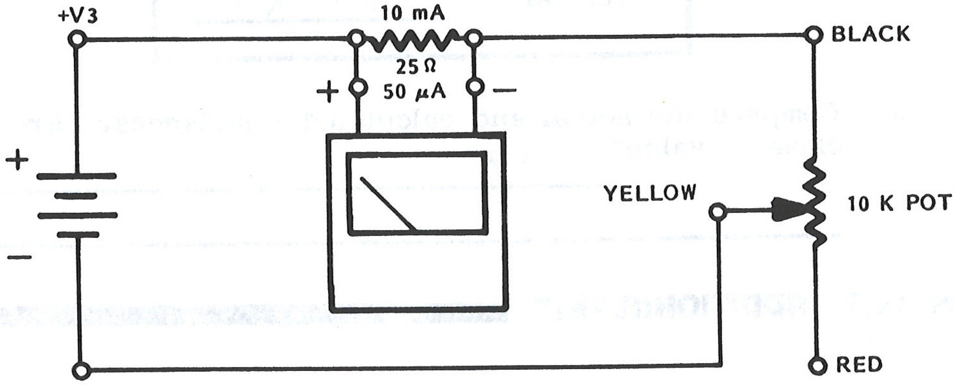


Figure 6 - EXPERIMENT circuit to calculate the unknown resistance.

3. Set the pot control knob at the approximate center of its rotation.

4. Apply power and adjust the pot for a reading of 5 mA.

5. Based on your adjustment and measured current and voltage, calculate the circuit resistance of Figure 6 by following the steps listed below.

STEP 1: Write the formula to solve for R.

$R = \frac{V}{I}$

STEP 2: Enter the known quantities.

$R = \frac{(5\ V)}{(5.18\ mA)}$

STEP 3: Perform the calculation.

R CALC. = .96 dk-Ω

14.2 OHMMETER MEASUREMENT

6. Without disturbing the setting of the 10 K pot, turn off the power and disconnect the two wires from the pot.

7. Use an external ohmmeter and measure the pot resistance between the arm (yellow) and the black jack; record the value below.

R POT MEAS. = .95 kΩ

8. Compare the actual and calculated resistances. Are they close in value? Ye

14.3 ADDITIONAL TEST

9. Reconnect the pot into the circuit.

Apply power and adjust the pot for a current reading of 5.5 mA.

15.1 LINEAR PLOT

2. Examination of Figure 6 shows that two voltage sources, +V1 and -V1, are wired in series for a possible total of 18 V (9 V + 9 V).

   Shown also is that both Voltage Control knobs are rotated fully Counter clockwise (CCW) for zero output.

   Note, also, that a second meter is used to measure voltage. A digital type (as shown) or an analog voltmeter may be used.

3. With both voltage controls rotated fully CCW, apply power.

4. Advance the +V1 control slowly until the meter reads 5 V.

   Observe and read the current flow on the panel meter and record the value in Table 1.

VOLTS	I (mA)
5	5.07
10	10.2
15	15.3
18 17.8	18.2

TABLE 1 - Volt-Ampere characteristic of a 1 K resistor.

5. Increase the +V1 to its maximum voltage +9 V and then increase the -V1 Voltage Control knob until the meter reads 10 V.

   Read the current flow and enter the value in Table 1.

6. Complete Table 1 for 15 Volts and 18 Volts, the highest possible voltage (9 + 9).

7. Plot the data developed in Table 1 on the graph of Figure 7 on the next page and connect the plot points to form a continuous line.

   Is the plot linear? ______________________________

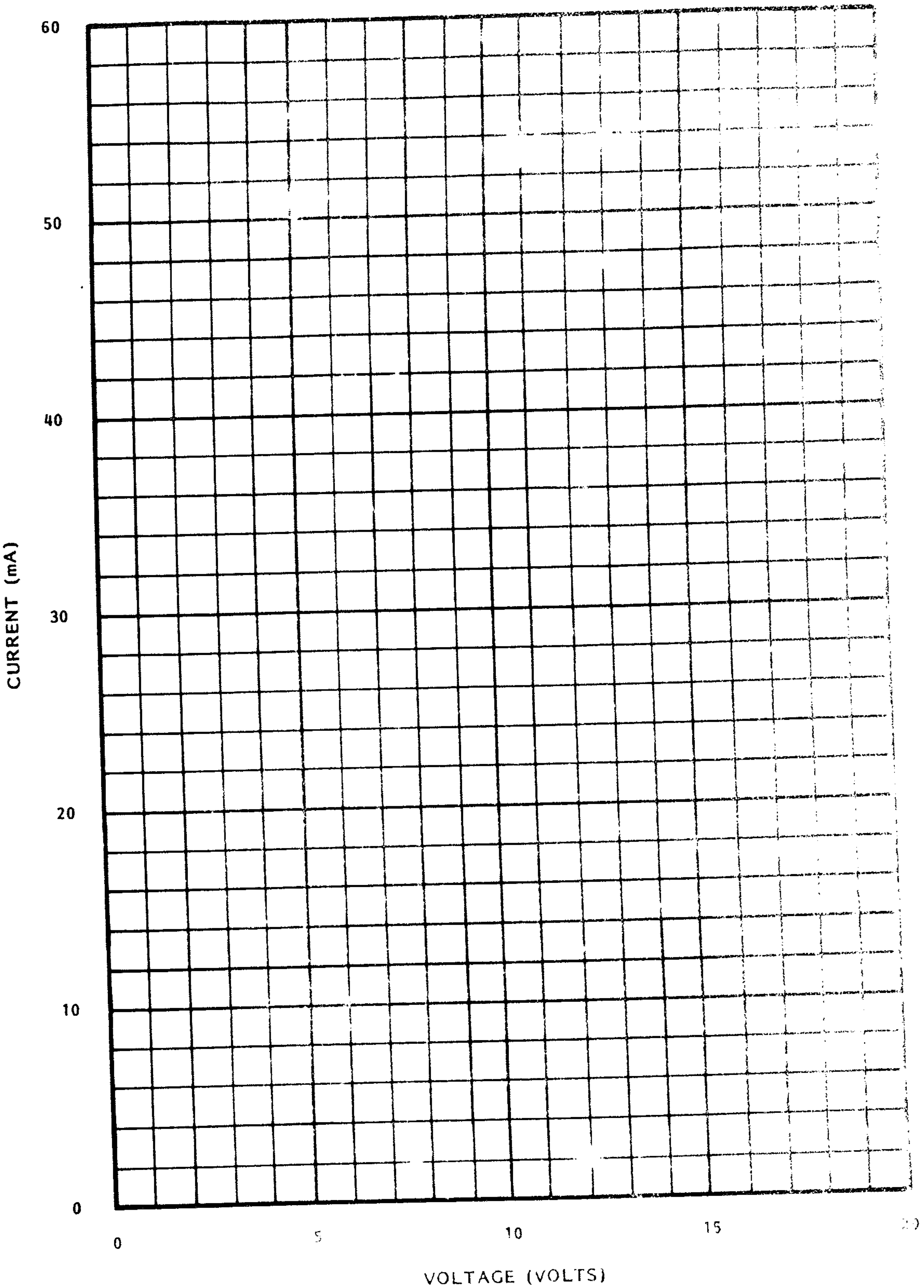


Figure 7 - Plot of a Volt-Ampere characteristics for the 1K resistor and the Incandescent Lamp.

10. Calculate the circuit resistance as outlined below. Use I in mA.

STEP 1: $R = \frac{V}{I}$

STEP 2: $R = \frac{(\ 5\ )}{(\ 5.5\ )}$

STEP 3: $R_{\text{CALC.}}$ = .909 KΩ

11. Without disturbing the setting of the 10 K pot, turn off the power and remove the pot from the circuit.

12. Use an external ohmmeter and measure the pot resistance with the ohmmeter and record the value below.

$R_{\text{POT MEAS.}}$ = ~~.909~~ .905

Compare the calculated and measured resistance values. Are they close? .905

CONCLUSIONS

We have learned from this experiment that:

The unknown resistance in a circuit can be calculated using Ohm's Law.

To calculate the resistance both the voltage and current flow in the circuit must be known.

The formula used to calculate the unknown resistance is

$$R = \frac{E}{I}$$

As the circuit resistance is decreased the current flow increases.

The circuit current and resistance are inversely proportional.

When I is used in mA, the resistance answer is in K Ω.

ASSIGNMENT

Answer the following multiple choice questions.

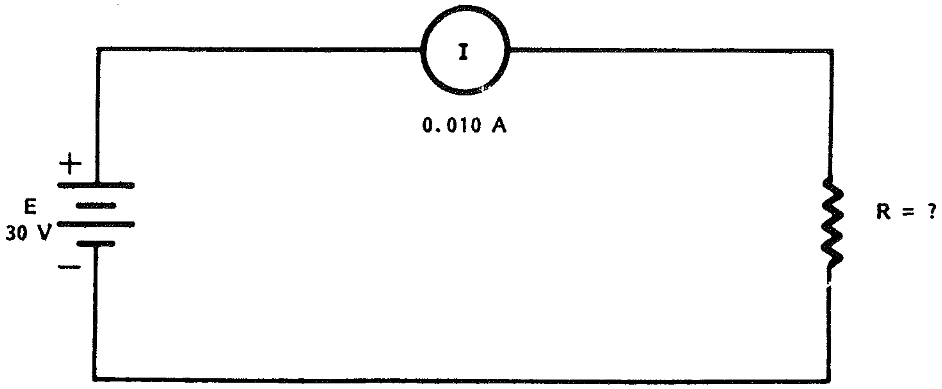


Figure 7.

1. The formula to be used to calculate the unknown quantity in Figure 7 is:

a. $I = E/R$
b. $R = I/E$
c. $R = E/I$
d. $R = EI$

2. The resistance in the circuit of Figure 7 is closest to:

a. 30 K
b. 3000
c. 3.3 K
d. 300

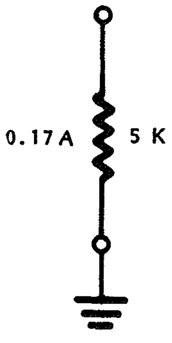
3. A voltage of 75 volts connected across a resistor produces a current flow of 15 mA. The resistor is:

a. 5000 ohms
b. 50 K
c. 2000 ohms
d. 20 K

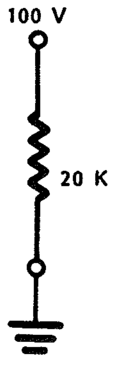
4. A current of 10 mA flows through a resistance of 1500 ohms. The applied voltage is:

a. 150 V
b. 75 V
c. 15 V
d. 1.5 V

5. Solve the following circuits for the unknown value. Show all work.



(a)



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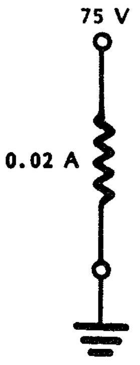

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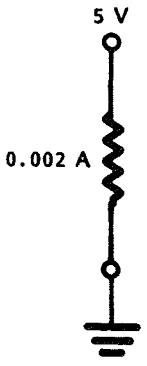

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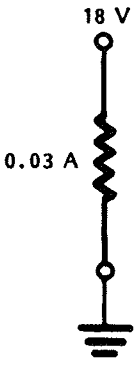

(e)